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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/073,751	02/09/2002	Arjun Kar Roy	01CON211P	4492
25700	7590	11/30/2004	EXAMINER	
FARJAMI & FARJAMI LLP 26522 LA ALAMEDA AVENUE, SUITE 360 MISSION VIEJO, CA 92691			CHU, CHRIS C	
			ART UNIT	PAPER NUMBER
			2815	

DATE MAILED: 11/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/073,751

Applicant(s)

KAR ROY ET AL.

Examiner

Chris C. Chu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 25 October 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1 - 5, 7 - 13, 15 - 18 and 28 - 31 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1 - 5, 7 - 13, 15 - 18 and 28 - 31 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Request for Continued Examination***

1. A request for continued examination (RCE) under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on October 25, 2004 has been entered. An action on the RCE follows.

### ***Response to Amendment***

2. Applicant's amendment filed on October 25, 2004 has been received and entered in the case.

### ***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 1 and 10 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant

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art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The original specification does not support the amendment, since the limitation "wherein said first and second interconnect metal layers are adjacent to each other" does not have basis in the original specification, i.e. there is no explicit teaching to this effect. Thus, this is a new matter rejection.

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 1 and 10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

It is unclear what the applicant regards as "said first and second interconnect metal layers are adjacent to each other" when the first intermetallic dielectric layer is located between the first and second interconnect metal layers.

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***Claim Rejections - 35 USC § 103***

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7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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8. Claims 1 – 3, 7, 10, 11, 15, 16, 28 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kumar (U.S. Pat. No. 5,120,572) in view of Lee (U.S. Pat. No. 6,117,789).

Regarding claims 1 and 10, Kumar discloses in e.g., Fig. 30 an integrated circuit chip comprising:

- a first interconnect metal layer (40; column 4, lines 26 – 28 and column 2, lines 63 – 65);
- a first intermetallic dielectric layer (a thin insulating layer; column 2, lines 65 – 67) situated over said first interconnect metal layer (40);
- a metal resistor (48; column 4, line 41) situated over said first intermetallic dielectric layer, said metal resistor being only connected to a second interconnect metal layer (92 and 94);
- a second intermetallic dielectric layer (polyimide 90; column 5, line 46) formed over said metal resistor;
- said second interconnect metal layer (92 and 94) over said second intermetallic dielectric layer, wherein said first and second interconnect metal layers are adjacent to each other (since the second metal layer 92 and 94 are located at next to the first metal layer 40 through the second dielectric layer 90, the first and second metal layer are adjacent to each other);
- a first intermediate via (at the place of 84 that is located in the first one from the left side and connected to the element 92) connected to a first terminal of said metal resistor, said first intermediate via being further connected to a first metal segment patterned (92) in said second interconnect metal layer (92 and 94);

- a second intermediate via (at the place of 84 that is located in the second one from the left side and connected to the element 94) connected to a second terminal of a metal resistor, the second intermediate via being further connected to a second metal segment patterned (94) in said second interconnect metal layer (92 and 94).

However, Kumar does not disclose a dielectric cap layer patterned on said metal resistor and covered by a second intermetallic dielectric layer. Lee teaches in e.g., Fig. 1E and column 3, lines 1 – 59 a dielectric cap layer (106b) patterned on a metal resistor (104) and covered by a second intermetallic dielectric layer (108a). Thus, it would have been obvious to one of ordinary skill in the art at the time when the invention was made to modify Kumar by adding the dielectric cap layer between the resistor and the second intermetallic dielectric layer as taught by Lee. The ordinary artisan would have been motivated to modify Kumar in the manner described above for at least the purpose of protecting the resistor from etching damage (column 3, lines 4 – 5).

Regarding claims 2 and 11, Kumar discloses in e.g., Fig. 30 said metal resistor being tantalum nitride (the resistive layer 42 in the resistor 48 is TaN; column 4, lines 28 – 42).

Regarding claims 3 and 16, Kumar discloses in e.g., Fig. 30 the material of the first interconnect metal layer (40) comprising aluminum (column 4, lines 26 – 28 and column 2, lines 63 – 65).

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Regarding claims 7 and 15, Lee discloses in e.g., Fig. 1E and column 3, line 11 the dielectric cap layer (106b) comprising silicon nitride.

Regarding claims 28 and 30, Kumar discloses in e.g., Fig. 30 said metal resistor being not connected from below.

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9. Claims 4, 5, 8, 9, 12, 13, 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kumar and Lee as applied to claims 1 and 10 above, and further in view of Zhao et al. (U. S. Pat. No. 6, 627, 539).

Kumar and Lee disclose the claimed invention except for the material of the first intermetallic dielectric layer comprising HDPCVD silicon dioxide (claims 4 and 12); the material of the second intermetallic dielectric layer comprising undoped silica glass (claims 5 and 13); an oxide cap layer (claims 8 and 17); and the material of the oxide cap layer comprising PECVD silicon dioxide (claims 9 and 18). Zhao et al. teaches in e.g., Fig. 2L the material of a first intermetallic dielectric layer (205) comprising HDPCVD silicon dioxide (column 4, lines 18 ~ 38); the material of a second intermetallic dielectric layer (224) comprising undoped silica glass (column 4, lines 18 ~ 38); an oxide cap layer (222; column 7, lines 17 ~ 20) situating between a metal resistor and a dielectric layer; and the material of the oxide cap layer comprising PECVD silicon dioxide (column 7, lines 17 ~ 20). Thus, it would have been obvious to one of ordinary skill in the art at the time when the invention was made to further modify Kumar by using the material of the first intermetallic dielectric layer comprising HDPCVD silicon dioxide; the material of the second intermetallic dielectric layer comprising undoped silica glass; an oxide cap layer; and the material of the oxide cap layer comprising PECVD silicon dioxide as taught by Geller et al. The ordinary artisan would have been motivated to further modify Kumar in the manner described above for at least the purpose of reducing resistivity and noise related to substrate coupling, and allowing an improved process window and simplifying the etching process (column 3, lines 20 - 28).

10. Claims 29 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kumar and Lee as applied to claims 1 and 10 above, and further in view of Ishii (U. S. Pat. No. 5, 422, 307).

Kumar and Lee disclose the claimed invention except for the thickness of the metal resistor to be 500 Angstrom. Ishii teaches in e.g., Fig. 14D and column 9, lines 61 – 63 the thickness of a metal resistor (212) being 500 Angstrom. Thus, it would have been obvious to one of ordinary skill in the art at the time when the invention was made to further modify Kumar by using the thickness of a metal resistor to be 500 Angstrom as taught by Ishii. The ordinary artisan would have been motivated to further modify Kumar in the manner described above for at least the purpose of (1) preventing a defective product due to bad connection and improving the yield (column 10, lines 36 - 38), (2) providing a high density integration (column 4, lines 59 – 61) and (3) reducing a thickness and weight of the semiconductor device.

#### ***Response to Arguments***

11. Applicant's arguments with respect to claims 1 and 10 have been considered but are moot in view of the new ground(s) of rejection.

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#### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chris C. Chu whose telephone number is 571-272-1724. The examiner can normally be reached on 11:30 - 8:00.



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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 517-272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.


Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>.

Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chris C. Chu  
Examiner  
Art Unit 2815

c.c.

Wednesday, November 24, 2004

  
**GEORGE ECKERT**  
**PRIMARY EXAMINER**

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